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PENNSYLVANIA
TRAIL OF GEOLOGY

MORAINE STATE PARK

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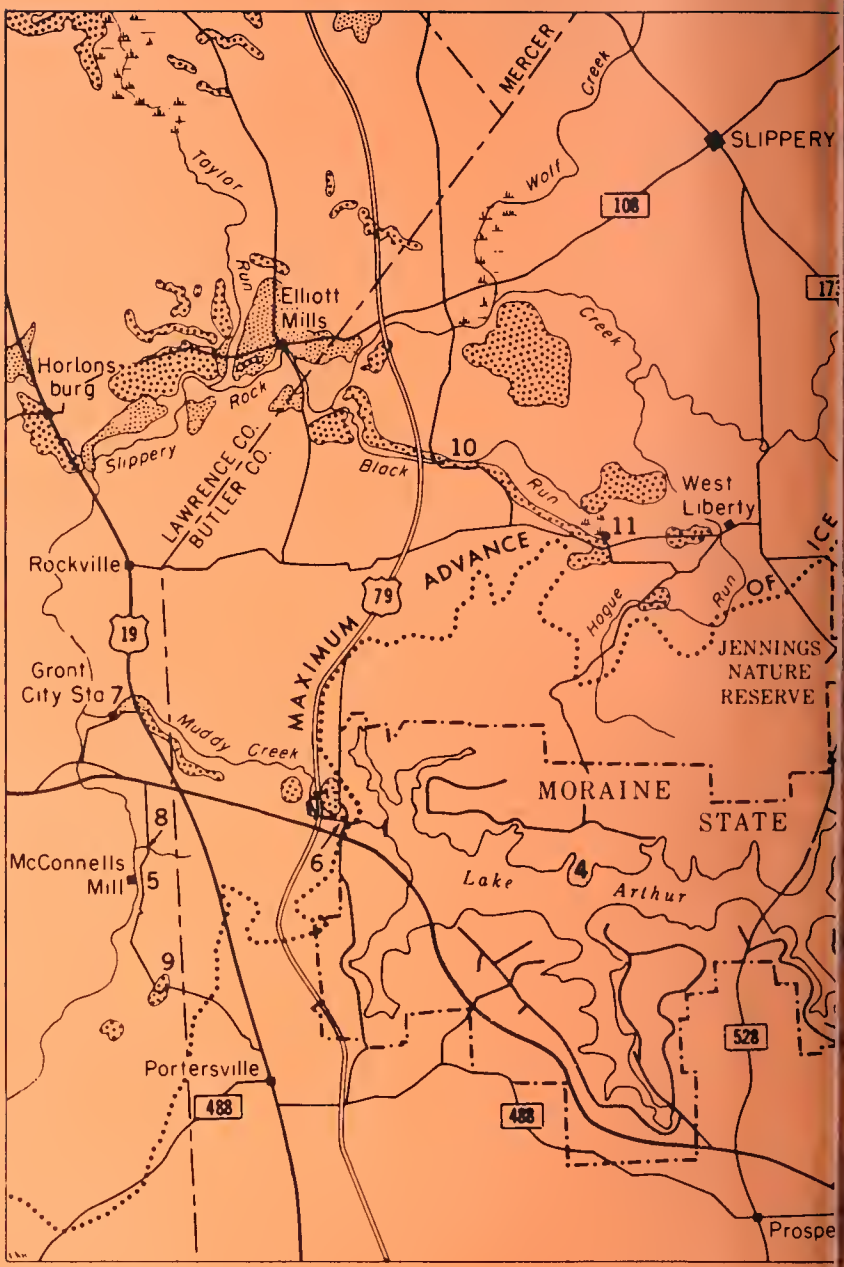


A SHOWCASE OF GLACIAL FEATURES

Lake Arthur

Lake Arthur in Moraine State Park lies at the site of a glacial lake that existed here over 10,000 years ago when the continental glacier covered much of northwestern Pennsylvania. Figure 2 shows the lakes that were developed during the maximum advance of the ice.

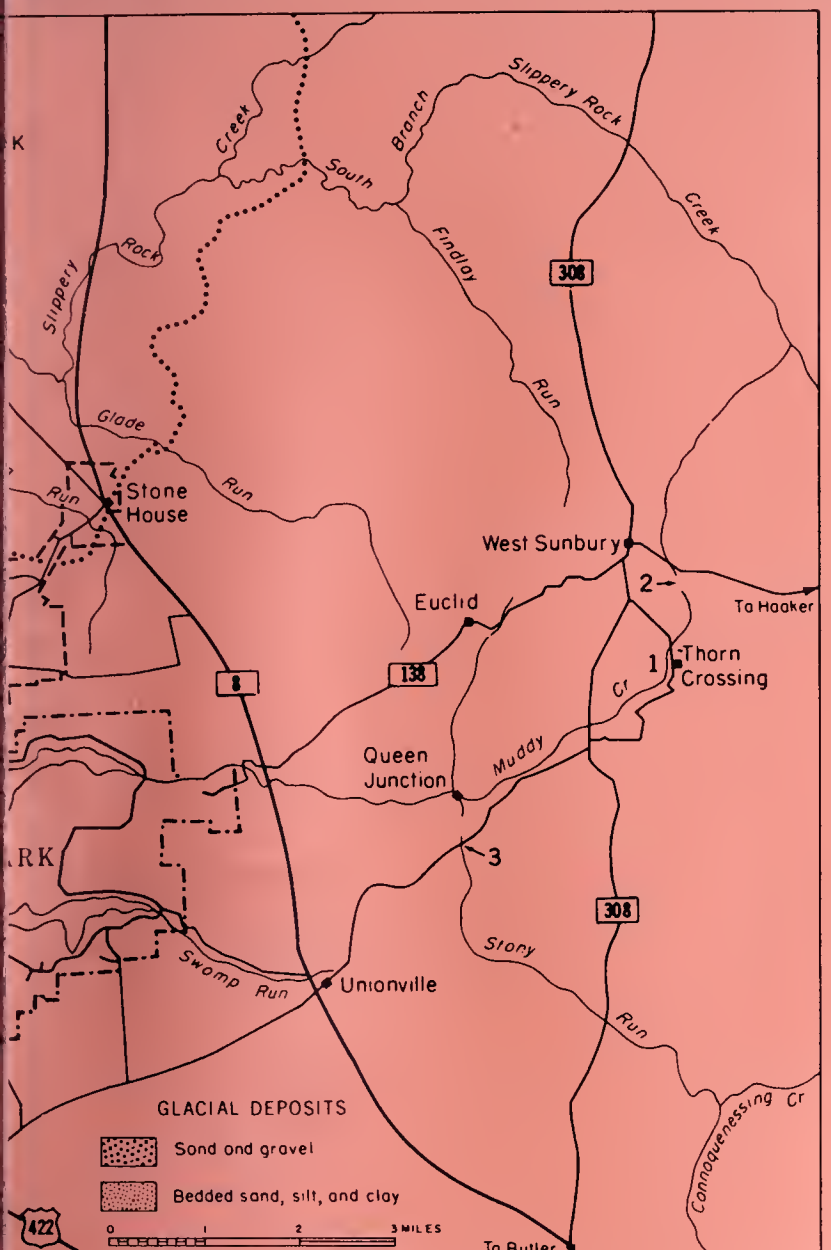


Figure 1. Moraine State Park and its environs. The roads within the park are those proposed as of December 1969.

The glacial ice, whose eastern edge was at Harrisville and Slippery Rock and lay just north of Portersville, dammed the westward flowing Slippery Rock and Muddy Creeks forming lakes in their valleys. Meltwaters from the glacier plus normal runoff caused the level of Lake Edmund to rise to an elevation of 1,310 feet and Lake Arthur to 1,260 feet, or possibly higher. Glacial Lake Arthur at its maximum development extended approximately six miles farther east than

the present Lake Arthur whose level is 1,190 feet. It extended all the way to Thorn Crossing (Figs. 1 & 3 Sta. 1). The waters of Lake Edmund escaped to the south into Lake Arthur over a spillway at West Sunbury (Fig. 1 & 3 Sta. 2) while the waters from Lake Arthur flowed southward over a cataract at Queen Junction (Fig. 1 & 3 Sta. 3) into Stony Run and then Connoquenessing Creek. During glacial time the Queen Junction cataract was a waterfall (sill). The tremendous flow of water over this sill cut the waterfall back northward perhaps half a mile, reducing its height to 60 feet. Evidence of this waterfall can still be seen in the steep sided valley. The former waterfall was removed when the Bessemer and Lake Erie Railroad was constructed in the valley.

During the early damming in the area by ice, the main drainage of Lake Edmund was through the pass at West Sunbury into Lake Arthur, trapping the coarser sediments in Lake Edmund while only the finest rock flour

Figure 2. The lakes at maximum advance of last ice invasion.

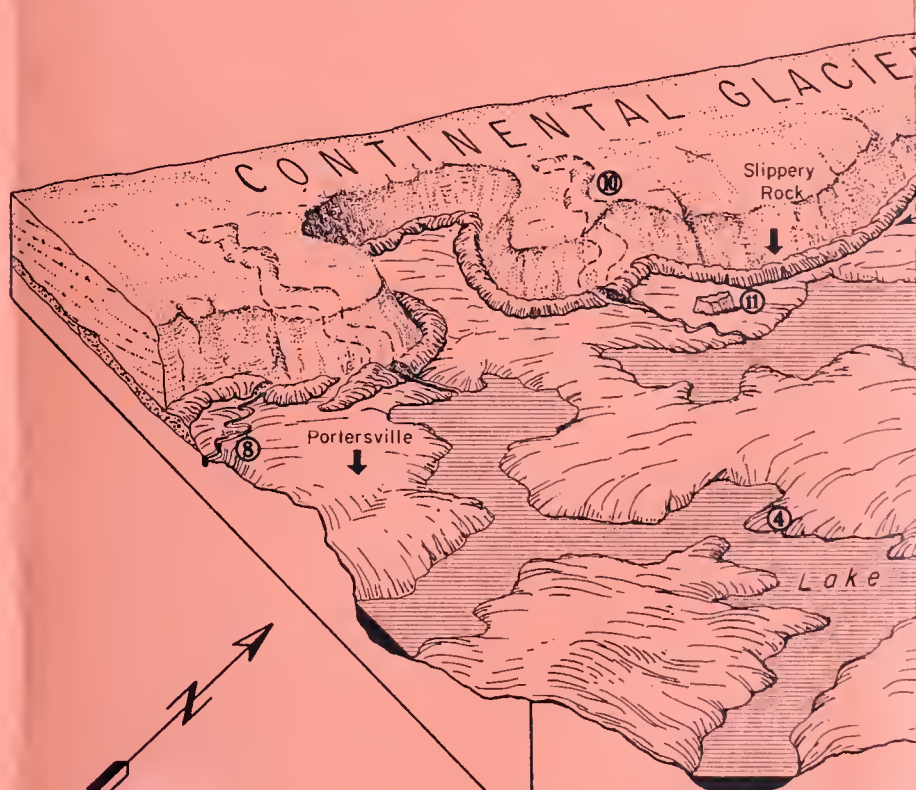
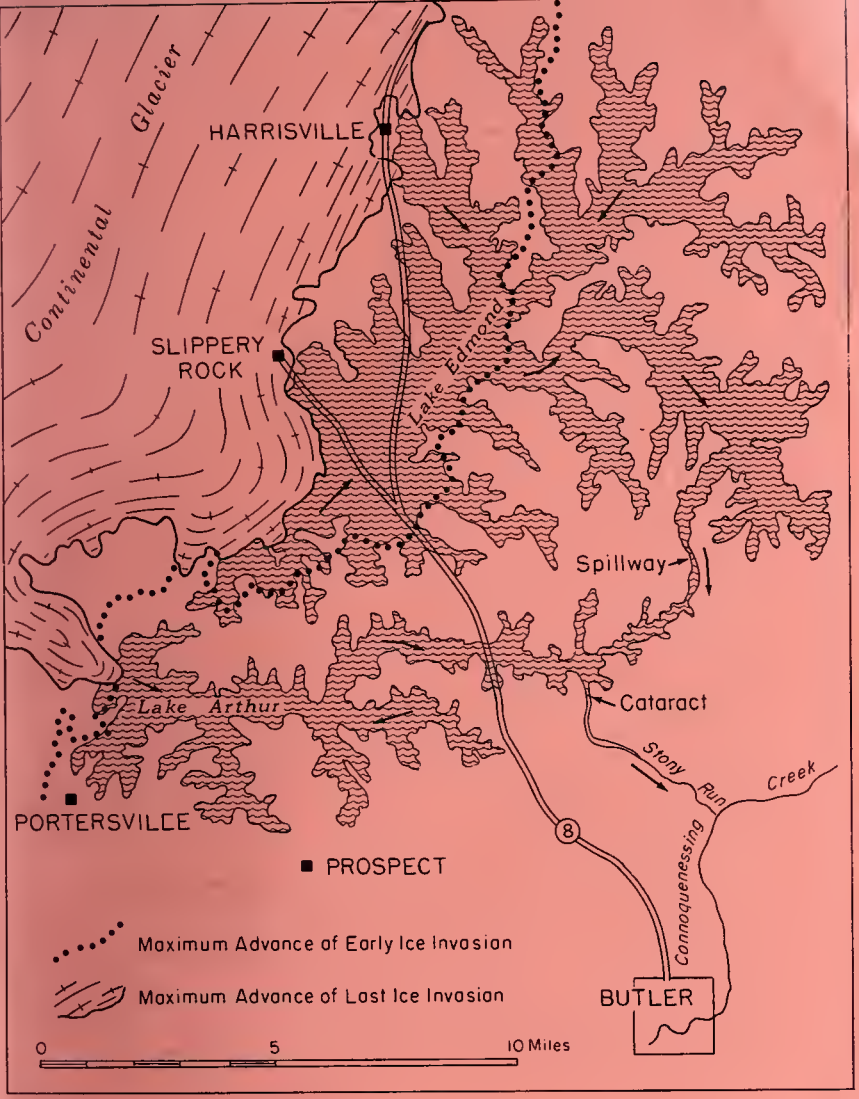
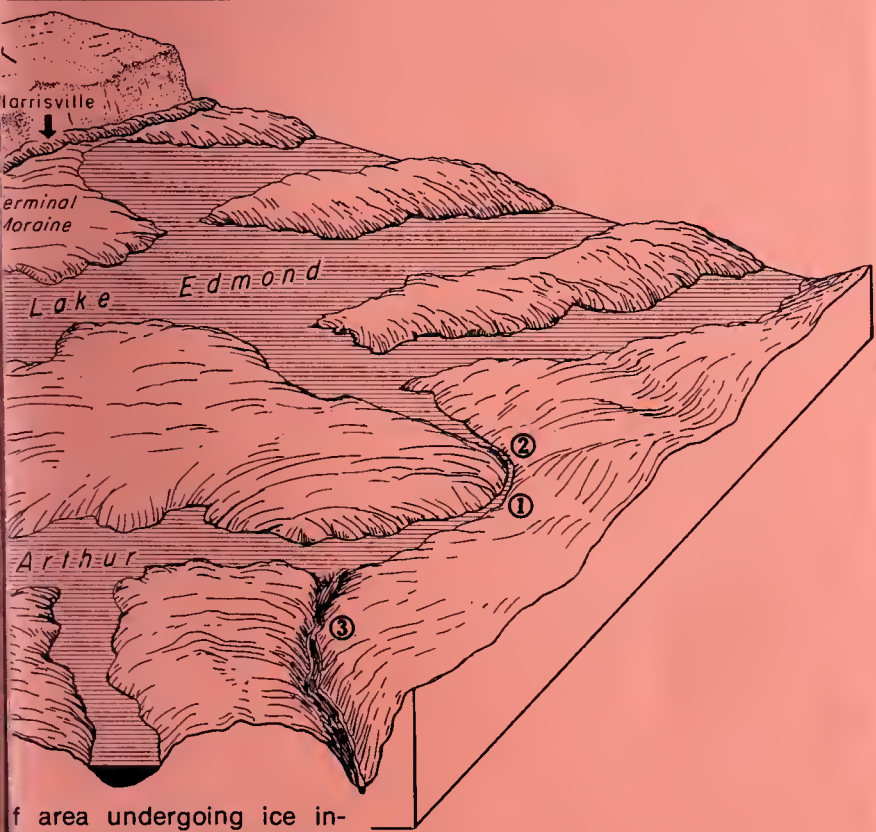


Figure 3. Block diagram
vasion with result





f area undergoing ice in-
g topography and deposits.

(gray clay) reached Lake Arthur. At Nealeys (Fig. 1 & 3 Sta. 4) 110 feet of fine sediments fill the valley which had been cut down through the Vanport Limestone by erosion in preglacial time. However, as the ice advanced, the western end of Lake Arthur began to have a buildup of sand and pea-gravel which filled and firmly blocked the old western outlet of Muddy Creek.

A warming trend caused the ice to retreat (melt) and opened many outlets or passes to the south at the western end of the two lakes. The waters from the two lakes poured through the passes in a vast flood to the south eroding the land and deepening the gorge at McConnels Mill (Fig. 1, Sta. 5), the present Slippery Rock drainage. Muddy Creek's new outlet to the west (Fig. 1, Sta. 6) into Slippery Rock Creek has been worn down about 40 feet in post-glacial time but it is still 140 feet above the Slippery Rock valley floor. The mouth of this outlet is a hanging valley with a waterfall at Grant City Station (Fig. 1, Sta. 7).

PROMINENT GLACIAL FEATURES PRESERVED IN THE PARK

Spillway Falls

With the retreat of the glacier several outlets were opened so the waters could escape to the south. One such outlet (Fig. 1 & 3 Sta. 8) is a spillway trench which acted as a sluiceway for the escape of the waters from glacial Lake Arthur over a sheer precipice. This formed a 60 foot falls with the water tumbling over broken rocks into Slippery Rock Valley below. The force of the escaping water carried large granite boulders and deposited them along the sides of the trench where they can be seen today.

Terminal Moraine

As the glacier moved forward, rocks of all sizes were frozen into the bottom of the ice or were pushed along by the ice. When the ice melted, it left piles of rock fragments which had built up around the end of the glacier. This is called the end or terminal moraine (Fig. 1 Sta. 9).

Esker

The meltwaters from the glacier found an outlet from the ice by flowing through a tunnel in the ice or at the base of the glacier. Sand and gravel were deposited all along the tunnel floor, which, when the ice disappeared, could be seen as a winding ridge across the land surface that looks like an abandoned railroad embankment. This ridge (Fig. 1 & 3 Sta. 10), called an Esker, is 3 miles long and is probably the best preserved esker in this part of the state.

Kettle Hole

As the ice melted, a large block of ice broke off from the edge of the glacier and became surrounded by sand and gravel deposited by the meltwaters. When the block of ice melted away, a pit (Fig. 1 & 3 Sta. 11) was left in the gravel plain where the ice block had lodged. Because of the pit's shape, it is called a Kettle.

William S. Lytle
Geologist

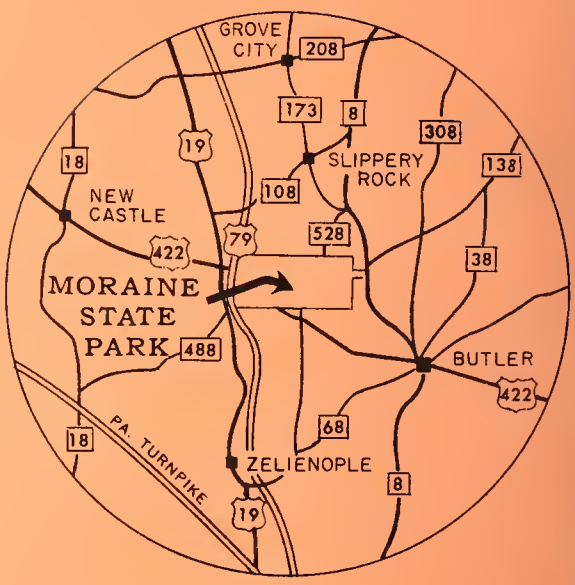
Visiting Hours

SUMMER SEASON

8:00 A.M. to 9:00 P.M.

OTHER TIMES

8:00 A.M. to sundown



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